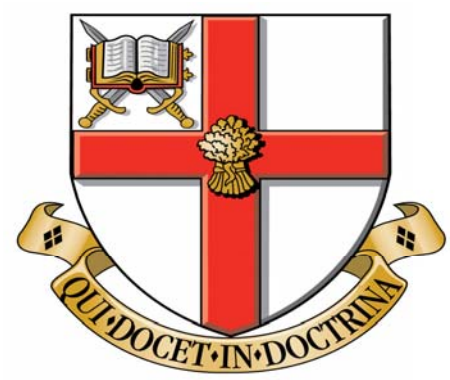

University of Chester

USING AN INTRANET TO DELIVER MULTIMEDIA TRAINING MATERIAL IN COLLEGES

CAMERON FURNIVAL

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ABSTRACT

The development of web-based training is now well established and is leading away from the notion of software being released solely on a CD-Rom; instead, it is made available additionally via Internet portals. The significance of this is that colleges with Intranets capable of delivering multimedia via an Intranet are well placed to take advantage of the growing market place for such training.

The basis for this research stems from the desire for increasingly faster and more efficient use of multimedia, which is delivered via an Intranet as opposed to the utilisation of CD-Rom technology. The implication is that software/ multimedia authors will develop more efficient systems that take best advantage of existing web-based technologies.

The trends evident from the small survey reported, show a general acceptance of the Intranet as a medium for the delivery of teaching and learning materials in addition to the established use of CD-Rom multimedia software. The inference is that the Intranet will not replace CD-Roms; rather, it will be used to complement it.

The education and training sector has become a major industry within the multimedia arena. Direction is sought to define the future trends in the development of multimedia training packages and styles from within this sector. The technology opens up new opportunities for learning and is an enabling factor in the restructuring of educational philosophies worldwide. However, the education and training sector has not allowed multimedia to cause a change in direction, rather, it is using it and other Information Technologies to engender and facilitate this required change. It is commonplace to find complex computing equipment in all areas of education and the uptake of multimedia, as a learning resource is widespread.

This research seeks to investigate the means of delivering multimedia in an educational context comparing the efficiencies and deficiencies of established techniques for the deployment of educational multimedia.

This work is original and has not been previously submitted in support of any other course or qualification.

Cameron Furnival

November 2000.

CHAPTER 1

1.1 The Role of the Intranet in a Learning Institution.

Multimedia is bringing significant changes to education in the way that learning resources are identified and utilised. The education sector is strategic to the overall development of multimedia with many key technologies being pioneered in the classroom. As Stewart (2000) argues: The trend towards learner centred education and training, with the learner taking more responsibility for their own education and training means that the motivation, resources and skills of the learner are the focus of the pedagogy and learning facilities.

Alvear (1998)(pvii) defines Multimedia thus,

> "Multimedia is one-way communication containing a mix of media elements, which can include any of the following: text, graphics, sound video and animation."

National strategies, for the adoption of Information and Communication Technologies (ICT) in education have created a demand for Intranets, which can deliver high quality multimedia at high speed. The speed of delivery of

programs to the desktop and the quality of the material are paramount considerations; the ideal being to provide high quality learning material at fast speeds using small amounts of the available bandwidth.

Andersen et al (1999) define bandwidth as the maximum bit-rate a network connection can handle; this implies that quality is proportional to the bandwidth of the network. In order to deliver curriculum content, there may have to be a compromise between quality and speed. The 'Intranet' solution obviates this, as a high bandwidth is available in a consistent manner. Intranet bandwidth is determined by certain protocols; the most common being "Ethernet". This allows a transmission rate of 10Mbps, which is far in excess of that achievable using a dial-up internet connection.

As learning institutions begin to provide opportunities for new electronic methods of teaching and learning to take place using increasingly advanced computer networks, the need to define an Intranet becomes important. Howe (1999) defines an Intranet thus, "Any *network* which provides similar services within an organisation to those provided by the *Internet* outside it but which is not necessarily connected to the Internet. The commonest example is the use by a company of one or more *World-Wide Web* servers on an internal TCP/IP[1] network for distribution of information within the company".

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[1] Transmission Control Protocol/ Internet Protocol. A protocol which allows the transmission of data using 'packets'.

Thus existing corporate networks can no longer be considered as simply a way to transfer information from a host machine or 'server' to remote client or desktop computer. Intranets have become a major growth area owing to the availability of cheap or free commercial browser and web server software, which allows them to provide a simple, uniform hypertext interface to many kinds of information and application programs.

Lynch (1994. p51) asserts that most Web sites were designed to be viewed by audiences inside an institution or company, and were often not even visible to the larger World Wide Web. While these Intranet sites shared the same technology as sites designed for the larger Web audience, the design and content of Intranet sites should reflect the very different motivations of Intranet users. He goes on to say, "Successful Intranet sites assemble useful information, organise it into logical systems, and to deliver the information in an efficient manner. It is imperative that users can get the information they need quickly and efficiently; whether this is a simple 'Worksheet', or full multimedia presentation with video".

The existence of networking protocols from companies such as Novell and Microsoft have been successful for many years and allow the sharing of information over quite large and complex networks with potentially thousands of machines and even more users. Most Intranets are computer networks which have been adapted using server technology (and associated software) to

transmit the data using TCP/IP. There are alternative ways to maximise the use of the available bandwidth. One such proprietary solution is Windows Media Technologies from the Streaming media Division of Microsoft. This is a solution which is gaining popularity as a way of managing multimedia delivered by Intranets. It essentially uses a different network protocol to allow users to share the same resources at the same time.

1.2 Significance of the study: Teaching and Learning

In the context of a learning environment the benefits of multimedia as a teaching tool are well documented, with many papers extolling the virtues of such resources, (McConnell (1998), Cowham(1997)) however, there is more evidence coming to light that multimedia (whether delivered from CD-Rom, Internet, or via an Intranet) is not the panacea that it was originally thought it might be. Roberts (1999) points out that, "What is clear from students' experience and the literature on learning is the need for dialogue and interaction between the subject expert and the student". In fact, Roberts strongly points to a preference for tutor interaction during directed study periods which led to a lack of motivation on behalf of some of the students. The students (first year undergraduates studying business degree programmes) agreed that the CD-Rom based learning materials were good but argued that teaching staff ought to have been facilitating their learning more proactively.

"Rather than students taking responsibility for their own learning their perception was one of staff dereliction of duty." *Roberts (1999, p14).*

It appears that a learning-culture change would have been necessary for students to benefit from the autonomous use of teaching materials in this way. However, there is a focus by some software producers on primary school multimedia learning packages which may engender a culture change of this type. McConnell (1998) argues, "A major factor in the up-take and use of ICT in education is the development of academic staff. This is particularly so in helping staff make the paradigm shift from "conventional" teaching and learning to teaching and learning in "virtual" or networked environments. He asserts that the distinctions that exist between on and off-campus learning are becoming increasingly blurred thus fuelling the debate about how and why pedagogical is changing towards a technology-centred approach.

1.3 Teaching and Learning.

Biggs (1999, p132) defines the relationship between teaching and learning thus, "Teaching is effective when it supports those activities appropriate to achieving the curriculum objectives, thereby encouraging students to adopt a deep approach to learning." He adds, "A good teaching system aligns teaching method and assessment to the learning activities stated in the objectives, so that all aspects of this system are in accord in supporting

appropriate student learning". It could therefore be argued that the use of multimedia in a learning environment is an appropriate use of a teaching resource, or even more strongly argued, that it can play an important part in the development of learning strategies which support appropriate student learning. England and Finney (1999, p9) talk about the lack of a link between traditional learning theories and multimedia. They highlight the use of multimedia as a way of presenting information via distance learning but, importantly, reflect on the approach of teachers and facilitators toward learning strategies. The inference is that these factors must be taken into account when designing multimedia for learning and, importantly that the feedback mechanisms used in a learning situation must be replicated in the multimedia package.

1.4 Limitations.

When using any mechanism for collecting data concerning student activities due regard must be paid to the Data Protection Act 1998. Currently, this Act applies to paper based and computerised systems. Essentially information collected on an individual must be gathered for a specific purpose and the integrity of that data must be assured (Section 59 Data Protection Act 1998). This may raise issues regarding the monitoring of students work if collected remotely (from a multimedia program for example). The data must be attributable to the correct author and opportunities for plagiarism must be

minimised. The data must also be securely stored and not used for any purpose other than that for which it was originally collected. Students must also have the right to be able to check that the data stored pertaining to them is correct. Thus, the use of an Intranet must pay due regard for this legislation. Although also true for a paper based system of recording student information, the use of technology in this way must give its exponents cause for concern, particularly with respect to the security of the data collected. Paper based systems are well established and traditionally secure, Computer systems running an Intranet must have safeguards in place to protect against malicious attacks on its security.

1.5 Defining the Problem.

Having outlined the way Intranets have developed, their protocols, bandwidth requirements and other technical issues, an understanding of their nature has emerged. Analysing the way multimedia has been developed to enhance teaching and learning strategies allows a symbiosis to develop which combines the technicality of an Intranet with the desire to use it as a vehicle for multimedia delivery. In order to gain comprehension of the development of Intranet philosophy it is advantageous to investigate the inception of web-based information structures and the implementation of a hyper-linked cross-referencing system of document retrieval which led to the development of 'Intranetworking' and thus the World Wide Web using the Internet.

The use of multimedia in education is well-established, with a variety of software publishers producing quantities of multimedia materials for a variety of age ranges and teaching groups. However software houses and designers of multimedia are turning their efforts to devising ways of delivering the content of their material more efficiently over the Internet. (Macromedia's Director/ Lingo). The impetus is to allow multimedia presentations to be adapted or streamlined for use on the Internet using scripting languages akin to structured programming. Thus, the same material will be eminently suitable for use over an Intranet – in fact, arguably more so on account of the better bandwidth provision.

With the inception of Managed Learning Environments, the Intranet is becoming a more important and valuable resource in educational institutions as a way of providing structured student support and monitoring of progress. With additional requirements coming from central government to instigate and implement strategies for the concept of lifelong learning, there is increasingly the need for an Intranet based service that will allow for centralised recording of information about students progress in their studies alongside established Management Information Systems which record other data and provide evidence for external bodies to which the institution is accountable.

It can be argued that the delivery of any course material using ICT requires an evaluation of the theory and practice of learning in order to make a shift

towards networked or distributed / distance learning, (McConnell 1998) and that the use of an Intranet as the medium for the delivery of it is a prerequisite. With the change of emphasis from CD-Rom based multimedia training material to web-based or Internet multimedia the use of an Intranet is further justified, and when put in the context of a completely managed learning environment, it could be argued that the majority of training carried out in colleges should be supported by this mechanism. (Cowham 1997)

CHAPTER 2

2.1 History of Intranets

The idea of hosting an internal web-like (HTML[2] based) information structure was one of the principles which enabled the World Wide Web to come into existence in 1990. Around this time, Berners Lee designed and implemented a cross-referencing system, (hypertext – based on an idea by Ted Nelson (1965)) which allowed computers of differing platforms to access documents on other networked machines within CERN. He went on to design a system which allowed links from one document to another to be followed regardless of the host computer's operating system/ platform. He used the Internet (already in existence from around 1970) to link pages of documents from one university to another thus creating a true hyper linked environment. Berners Lee (1999) states, " ...Internet newsgroups and articles were suddenly available as hypertext pages. In one fell swoop, a huge amount of information that was already on the Internet was available on the World Wide Web".

[2] Hyper Text Mark Up Language.

Roberts (1999) draws attention to a variety of learning theories; in particular, she cites the propensity for a 'task-based' approach. Constructivist theory as discussed by Biggs (1999) expounds the notion that learning is enhanced when "knowledge" is applied in a problem-solving scenario. It is clear from this that a user centred (student-centred) approach to training and learning ought to lend itself ideally to a teaching and learning situation. Additionally, in the UK, Integrated Learning Technology (ILT) has been adopted as a policy in Further Education Institutions. The main aims of the strategy adopted by Shrewsbury College are to:

> "exploit the use of ILT in order to 1. enrich the learning experiences of students 2. improve teaching methods and raise standards 3. facilitate better management practice & help develop a more IT literate society in line with Government targets" *(S-CAT ILT strategy 2000)*

2.2 *Working towards Solutions.*

Alvear (1998, p vii) asserts that, "Interactive multimedia and special effects are quickly becoming commonplace on the Internet. What was once confined to CD-ROM media is starting to be seen on the Web". Animated segments, platform-independent applications, and audio elements are now almost expected components of Websites. It is possible to listen to the radio as you

work (through a standard browser) and watch short excerpts of news. (e.g. http://www.cnbcdowjones.com/) As the capability of the Internet increases more multimedia will be delivered via the Web due to increased bandwidth, and sophisticated programming languages.

Stanek (1996) begins to address the advantages of streaming multimedia;
"In the past, browsers have been limited to pre-recorded and canned sequences, retrieved as full files. Video and audio files took minutes and sometimes hours to retrieve, thus severely limiting the inclusion of video and audio. The goal that everyone is moving toward is the creation of video that will be small enough to "stream" over the Web. This means you will not have to completely download the clip before you can start to watch it. Streaming video or audio will play in real time while the data is being received".

Andersen (1999, p10) adds that, "Streaming media began as a technological novelty, and originally (as with most emerging technologies) the quality was very poor (there was generally much needed in the way of adjustment and 'fine tuning' by the end user). Streaming media is now considered to be at the point of "crossover between novelty and communications medium".

To further define the role and nature of multimedia involves the analysis of the interface between user and multimedia product. Whereby a CD-Rom takes over the screen of the user's visual display (VDU) and displays a carefully controlled environment, this is not always possible for the multimedia

experience being delivered by an Internet/ Intranet. Lynch (1994) says, "The differences between most multimedia CD-ROM interfaces and those seen in mainstream Mac and Windows applications represent much more than an attempt to enliven the computer screen with visual sensation instead of information. In drawing their screen metaphors and graphic design from the worlds of television, video games, and film, many multimedia producers have (consciously or unconsciously) adopted a paradigm for interacting with computers that is fundamentally different from that envisioned by the designers of today's Mac and Windows graphic interfaces".

Casselberry (1996) describes one of the most pressing concerns about delivering multimedia content over an Intranet as being in the area of network bandwidth. He discuses the integration of multimedia technologies such as video-on-demand, and server versus client based processing.

"Networks are designed to handle a certain threshold of traffic and as usage approaches that limit, response times degrade, connections are refused, transmissions are cut off, and, in the case of streaming protocols like RealAudio, the content's resolution is degraded. ...Multimedia applications are particularly susceptible to these problems, since most of them require a great deal of digital information in order to encode their data. As more and more multimedia technologies are integrated, network response will rapidly increase". Casselberry (1996, p126)

To optimise the transmission of data it is advisable to compress the data required to produce a multimedia presentation and many algorithms exist for this purpose. The way this is done relies on successive changes in the media being small. That is to say each sample (of sound or video) tends to be similar to its predecessor. By storing the differences between samples, significant compression is possible.

2.3 *Targeting the Audience*

A recurring theme throughout the literature surrounding this subject is one of targeting an audience and matching the technology available to their expectations. Duff's approach incorporates this idea and proposes a solution to potential problems in this area,

> "Knowing what can be realistically and effectively viewed by your audience is key... If you are considering integrated multimedia, be cautious about how much you can deliver effectively".
>
> *Duff (1996, p98)*

Thus, effective delivery must take into account both the physical parameters of the medium and (particularly) the way the content is to be presented. This view is endorsed by Lynch & Horton (1999, p114), "The options for content are essentially defined by bandwidth. Audio files can be compressed so

effectively that sound can now be considered for site content, particularly for Intranet sites" However, in an earlier edition Lynch & Horton (1997) state, "There is one significant qualification in this discussion of multimedia design considerations. If you are creating a site for a specific audience and not for global interests you often have more flexibility and can ask more from your users". This implies that not only must a multimedia author understand the target audiences learning / training requirement, but must also have an understanding of the technical platform (or stage) on which the software is delivered. Korolenko (1997) understands the problem from another perspective; speaking as a writer, he asserts that multimedia producers need to assemble teams which include technical expertise as well as people with the ability to write a script.

Thus it appears that a multimedia author may expect a higher degree of information retrieval/ handling skills from certain audience groups than others. They may be required to add software (download plug-ins for example) in order to view parts of the multimedia package and if they should choose not to, they are making an informed decision about the validity of that part of multimedia experience available to them. Importantly, in this context, the audience has a deeper level of control over their involvement with the software.

Moving away from the idea that multimedia content is strictly the preserve of CD-Rom and acknowledging that the Internet will eventually accede to its

demands for higher bandwidth, we are left with the potential to exploit it as a learning tool over a corporate network or Intranet. This implies that given sufficient server processing power, and network bandwidth, groups of students will be able to access the required learning materials either autonomously or as part of a directed learning experience; i.e. the facilitator can use the appropriate material at a given time. The effect of such a strategy will enable illustrative examples, video, sound etc to enhance a lesson or lecture. Stanek (1996) defines the art of streaming content across a 'web' in terms of the content of the streamed media being 'instant' as opposed to downloaded, opened and played. The concept of 'streaming' is one whereby a media file can begin to play as soon as an initial piece of the software has been downloaded, thereby increasing the immediacy of the information.

The emergence of high-speed Networking and Internet access (particularly with the advent of digital telephony) could be the key factors which bring streaming media to the masses in the near future. Currently however, bandwidth constraints prohibit its use outside all but the most efficiently operated Intranets. It is certainly true to say that multimedia has flourished with the evolution of the Internet; previously the most efficient way to experience multimedia was via CD-Rom. An alternative was to download a media clip from the Internet, which after a lengthy wait (dependent upon the quality and speed of the connection) could be opened and used on a user's machine.

The real-time transfer of video data streams introduces new problems of maintaining adequate playback quality in the face of network congestion and client load. Nevertheless, a large number of companies are making streaming video a reality (with varying levels of success). This leads to the notion of 'video-on-demand' and verges into the realms of making multimedia (essentially a one-way process) into what must ultimately become a fully interactive process.

2.4 The Research Problem

What this research hopes to achieve is an understanding of the comparative benefits of using an Intranet to deliver a multimedia training exercise, to simply running software from a local hard disc or CD-Rom. Thus, this research is undertaken to compare and contrast the effectiveness of a software package using Intranets and CD-ROMs as the delivery vehicle.

Understanding that multimedia is becoming increasingly interactive, not in terms of interacting with the program but with the system through which the program is delivered to the desktop implies that the system itself has to be capable of producing the deliverables of a curriculum and of monitoring, providing feedback, and record keeping. These issues are largely dealt with elsewhere, and do not in themselves provide problems of the type under investigation. The comparison with Internet delivery is discounted since the

essential nature of the Internet enables the same facilities as an Intranet albeit at a much slower pace and with inherent reliability issues (continuity of connection for example).

2.5 *Teaching and learning Case Studies – background*

Shrewsbury College of Arts and Technology is the largest general further education college in Shropshire. The college offers a wide range of courses in nine of the Further Education Funding Council's programme areas and has a few students in the tenth - agriculture. The college has a wide range of vocational courses and responds well to local needs. Employers and training agencies have commented on the college's increasing responsiveness and customer awareness. There are close relations with local colleges, schools, companies, and the Shropshire Chamber of Commerce Training and Enterprise. The college has developed and established an Intranet based on current standards of best practice and access to IT facilities is good for all students.

The College's mission statement (2000) points clearly to making the use of Information and Communication Technology as an intrinsic part of the delivery of the curriculum and the development of Information Learning Technology strategies.

The case studies which follow seek to inform the reader how an Intranet is presently being developed as a learning resource. A general overview is appropriate as Case Study 1 (section 4.2) and specific examples of usage are used as case studies 2, and 3 (sections 4.5, and 4.7 respectively).

2.6 Case Study 1 – background

As part of government initiatives to rationalise post-compulsory education (16-19) syllabuses have recently been changed to reflect a generalised form of assessing students Key Skills in areas of Literacy, Numeracy and Information Technology. The method of assessment in all three areas is to embed the teaching of these skills into the coursework (syllabuses were changed in 1999/2000 to give opportunities for assessment) and assess the level of competence in each area independently using a "level" type indicator (one to four – four being the highest). Currently, only levels 1 to 3 have been made available for assessment purposes. It is part of the college's policy to utilise the facilities of the Intranet to deliver and monitor the students' progression.

Delivery of Key Skills represents real challenges to teachers/ lecturers. While integration of learning with other subjects/ modules and vocational training is in many ways the ideal, specialist teachers and instructors sometimes struggle with the generic nature of Key Skills, and often do not have complete

confidence in their own abilities, particularly in IT and number. This has led Shrewsbury College to appoint a Key Skills Coordinator in each of the three main subject areas (Numeracy, Literacy and IT), and purchase software, "Searchlight" (SHL plc), to be delivered via the Intranet in order to allow every student on full time courses to have a 'base-line' assessment carried out and the results recorded in a database automatically.

2.7 Case Study 2 - background

The European Computer Driving Licence (ECDL) was "designed to raise the level of general competence in IT across Europe, to improve the confidence and productivity of IT users, whatever their age, ability and work status." (www.ecdl.co.uk). The ECDL syllabus is designed to cover the key concepts of computing and the use of common applications in the workplace particularly Microsoft Office and Lotus SmartSuite. It is broken down into seven modules, each of which must be passed before a certificate is awarded. The modules are: basic concepts of IT; using the computer and managing files; word processing; spreadsheets; database; presentation and information & communication. Because of the discrete nature of these subjects, one could not use the ECDL as a basis for studying Key Skills (which must be embedded into a larger field of study) and so ECDL is offered as a 'stand-alone' subject.

Carpenter (1999) comments within the ECDL website that, "There have been significant developments in ECDL participation over the last twelve months in the UK ... Countries like Sweden, Denmark and Ireland have achieved well in excess of 1% penetration of each country's population during their longer period of time incorporating the ECDL syllabus. If we put that into UK context, the potential growth opportunity is enormous, reaching a figure of 1million or more students each year. ECDL is proving its worth - it has a very exciting future ahead of it."

2.8 Case study 3 - background

A further example of the college's desire to provide training in the field of Information Technology is in its decision to become involved with the BBC's WebWise programme. The target audience is, "adult beginners who recognise that the internet offers them benefits (for employment, their children's education, leisure and communication) but who lack confidence, are confused by the choice and are looking for a trusted, objective guide to getting started". (http://www.bbc.co.uk/webwise/).

Through partnerships with a range of organisations, both traditional (e.g. schools, colleges, libraries) and non-traditional (cyber cafes, pubs, shopping centres) the WebWise campaign aimed to create a network of organisations willing to offer introductory sessions to people motivated by the campaign's television and radio publicity. Over 5,000 organisations took part in the initial

phase of which Shrewsbury College was one. The scheme was immensely popular (refer to appendix C) and is now produced in tandem with the BBC Learning Zone. There is now an option for learners to continue their work with a further on-line learning package that is currently being developed.

CHAPTER 3

Methodology

3.1 Introduction

In order to judge the merits of delivering multimedia via an Intranet it is necessary to investigate the main principles behind Intranet design and use. Thus, the usefulness of the Intranet as a medium will become apparent or otherwise.

Industry has different requirements from education in their Intranets; the information must be accessible in an easily assimilated form. This has come to mean that corporate Intranets are largely text-based pages with little in the way of graphic design elements, and are capable of delivering high volumes of information across a its Intranet very quickly. Education and training, on the other hand need to reinforce learning points with pictorial images, clips of video, tests, and often, immediate feedback to the user of their progress. Therefore the aim of this research is based on the educational / training use of an Intranet as opposed to a business model.

CD-Rom can test the learners understanding in exactly the same way as any other form of multimedia experience, however the assimilation of data/ test results by the educator is difficult without externally marked assessments.

To assess the efficacy of Intranet delivered multimedia there are two aspects of interest:

Why use an Intranet to deliver content as opposed to CD Rom or Internet?

What are the advantages / disadvantages of this method?

The main areas of the research are to enable a focus on: speed of delivery, assessment of learning points, and ease of access. Technical reliability and smooth delivery are also important aspects which will be assessed.

3.2 Study Design

In order to assess these issues a variety of both qualitative and quantitative techniques could be employed to obtain data which will go some way toward an understanding of the nature of the problem. Bell (1992, p128) defines the difference between quantitative and qualitative research as follows, "Quantitative researchers assimilate facts and study the association between one set of gathered facts with another, while qualitative researchers are more interested in understanding individuals' (or groups') perceptions of their environment".

Benbasat et al (1987) state that case study research is suitable for studies that are in early or formative stages or where the experiences of the subjects are important and the context within which they operate is vital. Further to this, Benbasat et al (1987) provides three reasons to suggest why the case study approach is suitable for information systems research strategy, all of which were also appropriate to this study:

- The researcher can study the information system in a natural setting.
- The researcher can answer "how" and "why" questions.
- It is suitable for studies in which little formal research has been conducted previously.

Critics of the case study approach may argue that it leads to a lack of generalisation. However, Bassey (1999) argues that studies leading to what he terms as "fuzzy generalisation" can be valuable in an understanding of the problems being investigated. From an earlier work he states that if case studies are:

> "carried out systematically and critically, if they are aimed at the improvement of education, if they are relatable, and if by publication of the findings they extend the boundaries of existing knowledge, then they are valid forms of educational research." *(Bassey, 1981. p86).*

Since the outcomes of this research are not intended to result in a generalisation at this time, it is hoped that the outcomes of this report should stimulate further research into the mechanisms surrounding the educational use of Intranets to deliver teaching strategies.

3.3 *Sampling*

Since no generalisation was intended from the findings of this research it could be argued that the sampling strategy was unimportant. However, Benbasat et al (1987) assert that the sampling should be carefully thought out rather than opportunistic.(sic). There are several ways of sampling and the reasons for each technique is discussed briefly. Kumar (1999) defines three categories of sampling;

- random/ probability sampling designs
- Non-random/ probability sampling designs; and
- mixed sampling design.

Random sampling design involves the random selection of subjects from the population under study. Each element within the population must have an equal and independent chance of being selected for inclusion in the sample. There are two techniques for this: simple random sampling or stratified

random sampling. The usual way of random sampling is to use a table of random numbers (either tabulated by computer program or other means), or a 'goldfish bowl' type of selection (as used in some type of lottery. This leads to simple random sampling, but it could be argued that a lesser degree of heterogeneity is desirable in the sample and thus a stratified approach could be adopted. In this method, the researcher may subdivide population into strata within which a high degree of homogeneity is established (eg gender or age) and as long as the stratification has a bearing on the issue being researched then a higher expectancy of accuracy can be surmised.

Kumar (1996) suggests that sampling theory is guided by two principles:

1 the avoidance of bias in the selection of a sample; and

2 the attainment of maximum precision for a given outlay of resources

Within this research, given the small population from which a sample will be drawn, elements of bias may be apparent, however, this study wishes to analyse a particular aspect of the problem in general terms, and develop techniques by which a larger population can be investigated in the future. In addition, sampling techniques as described will help alleviate the problem and lead to a degree of reliability and validity.

3.4 Reliability & Validity

Peräkylä (1997) states, "the issues of reliability and validity are important, because in them the objectivity of research is at stake". Bell 1999 further asserts that "Reliability is the extent to which a procedure produces similar results under constant conditions, on all occasions". In the case of this study, the reliability of the research results depends on whether or not the same findings would occur if the study was repeated in the same manner under similar circumstances, however, the worth of such testing is suspect and of little use. It would be of greater benefit to extend the boundaries of the research to include different types of institution with different cohorts of students.

It is well documented that data collected using interviews are open to problems such as interview bias, prompting and issues of question wording. Thus the main source of data collection would be via anonymous questionnaire. This ensures reliability without bias as far as is possible under the conditions of this research. If part of the research is unreliable, then Bell (1999) asserts that it is also invalid.

"If an item is unreliable then it must also lack validity, but a reliable item is not necessarily also valid" *Bell (1999 pp 104).*

Bell (1999) asserts that Validity describes whether an item measures or describes what it is supposed to measure or describe and adds that there are many subdivision and variations of validity. She argues that it is "rarely necessary to delve deeply into the measurement of validity" in this context. Kumar (1999) describes different types of validity; Construct validity, Concurrent and predictive validity, and Face Validity.

Construct validity is based on statistical procedures. The contribution of each 'construct' to the total variance observed in a phenomenon is ascertained (Kumar (1999).

Concurrent and predictive validity is criterion based. Using one method to measure a phenomenon and then making a comparison with another method concurrently gives an indication of the validity of the methods; if they reach similar indications, then a high degree of validity is expected. This can then be used to predict an outcome and if the outcome is as expected, then once again, a high degree of validity is the result.

Face Validity can be defined thus: "Face validity pertains to whether the test "looks valid" to the examinees who take it. the administrative personnel who decide on its use, and other technically untrained observers. Anastasi (1988) (p.144)." In other words, the validity is based on the perception of the respondent as to whether or not the test appears valid.

3.5 The study population

With recent government initiatives (Dearing 1997), many teaching staff in colleges and Universities are utilising or developing managed learning environments and Intranet facilities to ease the pressures they face from increasingly demanding technical constraints on the way learning methodologies are to be delivered. With ever-increasing student numbers it is important to ensure such computerised systems are efficient and effective. At Shrewsbury College of Arts and Technology the use of the existing Intranet has been developed in order to allow students access to learning materials (lecturers' notes, assessment material etc) and also to use on-line learning materials, such as those previously only available on CD-Rom; this is part of an on-going strategy within the college to provide "electronic handouts" and to develop more interactive Intranet based teaching and learning activities.

Students using one or more multimedia packages delivered by Intranet and other methods were invited to comment on their perception of how the software has helped in their studies; their views gathered by questionnaire. In addition, it was useful to gather the opinions of technical support staff (by open-interview) to ascertain the benefits of delivering course content through multimedia via an Intranet, in this way issues of reliability and ramifications to the college's network as a whole (e.g. bandwidth problems resulting from increased usage at certain times of the day) would become apparent. Also, a sample of teaching staff using this method of teaching were invited to

comment (by interview and questionnaire) on their perception of the effectiveness of Intranet delivery in their teaching methodologies, in particular the collection of data for internal assessments and feedback to students.

It was made clear that the questionnaires would remain anonymous and that comments they made would not be attributable to them. This was compounded by the promise that the lecturers assigned to teach the classes would not have access to the raw data.

3.6 The Sample

The sample consisted of students in all adult learners evening classes at the college receiving some multimedia learning experience delivered via the Intranet this was in order to target those students who had to rely on multimedia learning materials heavily as a prescribed part of their course. Approximately 60 students were surveyed at this time in order to provide a small-scale study and inform further research. Some students were taking the WebWise course, others the ECDL. Informal interviews were carried out with students on all the courses pertaining to the case studies. Questionnaires were given to a random sample of students chosen from the student group (about 50% of the population). Using 100% of the sample may have introduced aspects of bias that may not be representative of the whole population of students.

Kumar (1999) suggests that a random sample of this type will be both representative and largely unbiased. Using anonymous questionnaires drawn from a random sample (perhaps using a random number generator program had the sample been larger) helped to alleviate the possibility of bias and was also representative. Selecting 50% of the population gave a good level of confidence. Since the emphasis of the research was in trying to measure attitude and opinion, the confidence level ought to be satisfactory from a randomised sample of 50%.

Responses to questionnaires were encouraging, with approximately 88% return rate (53out of 60). This was accountable by students being asked to fill in a questionnaire at the end of a scheduled session since Bell (1999)(p129) refers to the non-response to questionnaires and argues that, "You are likely to get better cooperation if you can establish personal contact." There were, of course absentees who were unable to complete the questionnaire. Of the 60 questionnaire distributed, 4 were returned unanswered and 3 were lost/ not submitted.

3.7 Instrumentation

The instruments used to collect data were questionnaire and interview. These methods allow for triangulation of the data, which in a study of this nature

allows corroboration of the evidence. Semi-structured open-ended interviews (Gillham 2000) allow the interviewer to analyse responses and enhances discovery. With a very small sample (technical support staff) it was thought that this approach would be most beneficial. In order to gain the most from this exercise it was important to schedule interviews at mutually convenient times to allow full and frank discussions to take place.

The questionnaire approach to obtaining information is well documented and has many pros and cons. Gillham (2000) asserts that there is a conflict or "tension" between originality, discovery and validity of verbal data. His arguments for the use of a questionnaire are given as follows;

- Low cost in time and money
- Easy to get information form lots of people quickly
- Respondents can complete the questionnaire when it suits them
- Analysis of closed questions is straight forward
- Less pressure for an immediate response
- Respondent's anonymity
- Lack of interviewer bias
- Standardisation of questions
- Can provide suggestive data for testing an hypothesis.

Kumar (1999) adds the caveat that questionnaires can introduce elements of self-selecting bias (through non-return) and typically have a low response rate. This was addressed in this research by distributing questionnaires during the scheduled lectures (prior to a break in the lesson) and collecting them from the students as they left the room.

Various multimedia teaching package are in use throughout the college, but the most common are "WebWise" which is produced by the BBC as an introduction to using the internet (called a "taster session"). Other students are engaged on the "European Computer Driving Licence (ECDL), which uses a range of teaching techniques from a didactic approach to completely student-centred. Students studying the ECDL and WebWise courses submitted questionnaires, and in addition a range of interviews was conducted with students from all the courses; this is discussed in the case studies (chapter 4).

CHAPTER 4

4.1 Introduction to the case studies

Shrewsbury College of Arts and Technology is the largest general further education college in Shropshire. The college has a wide range of vocational courses and responds well to local needs. Employers and training agencies have commented on the college's increasing responsiveness and customer awareness. The case studies which follow seek to inform the reader how an Intranet is presently being developed and used as a learning resource and contrast its use with more traditional uses of technology.

Detailed within this research are case studies showing how the Intranet is becoming increasingly used as the vehicle for delivering teaching and assessment materials. The case studies how multimedia is used in several ways. In **Case Study 1** it is shown as an assessment tool (Searchlight) (section **4.2**). In **Case Study 2** it is used as an aid to the delivery of a programme of study (ECDL) (section **4.5**). In **Case Study 3** multimedia is used as a stand-alone resource (WebWise) (section **4.7**). Each is dealt with separately in the relevant section.

With multimedia-based programs being used throughout the college for different target groups, each with different aims, (WebWise for Internet beginners, ECDL for students learning to use an Office suite, and others including multimedia PowerPoint presentations developed by staff) it was possible to focus on the perceived advantages/disadvantages of using the Intranet as the delivery medium.

The next part of this chapter offers some reflection and observations on the findings that emerged during the research period.

4.2 *Case study 1 – using an Intranet for base-line assessment*

As part of government initiatives to rationalise post-compulsory education (16-19) syllabuses have recently been changed to reflect a generalised form of assessing students Key Skills in areas of Literacy, Numeracy and Information Technology. The method of assessment in all three areas is to embed the teaching of these skills into the coursework (syllabuses were changed in 1999/2000 to give opportunities for assessment) and assess the level of competence in each area independently using a "level" type indicator (one to four – four being the highest). Currently, only levels 1 to 3 have been made available for National assessment purposes. It is part of the college's policy

to utilise the facilities of the Intranet to deliver and monitor the students' progression.

Delivery of Key Skills represents real challenges to teachers/ lecturers. While integration of learning with other subjects/ modules and vocational training is in many ways the ideal, specialist teachers and instructors sometimes struggle with the generic nature of Key Skills, and often do not have complete confidence in their own abilities, particularly in IT and number. This has led Shrewsbury College to appoint a Key Skills Coordinator in each of the three main subject areas (Numeracy, Literacy and IT), and purchase software, "Searchlight" (SHL plc), to be delivered via the Intranet in order to allow every student on full time courses to have a 'base-line' assessment carried out and the results recorded in a database automatically.

This computer-based package is designed to profile ability and predict how an individual will cope with the key skill requirements of a course. It assesses the abilities and skills seen as essential to the acquisition of the application of key skills in application of number, communication and IT. These abilities are mapped onto the revised (2000) Key Skills specifications. Any combination of key skills and level can be assessed in one session. There is a range of comprehensive reports available immediately after testing which are made available to both the tutor and the student.

The programme is delivered to the desktop, the student responds to the exercises and the data is stored centrally. Currently, the process is being handled by four 'servers' (two on the main campus and two at satellite colleges). The amount of data generated in this exercise was predicted to be large and thus the college employed a 'Data Clerk" to oversee it.

4.3 Using Searchlight.

Before a student can use the Searchlight system an estimate of their current Key Skills levels has to be made. A 'blanket' approach was adopted originally with one or two special cases arising; all students on GNVQ Advanced or Btec National Diploma level courses were assumed to be working towards level 3 and were assessed initially using the question banks for that level. GNVQ Intermediate students were considered as level two candidates and Foundation level courses were set to level one. This was achieved by an agreement in principle between the college management and Heads of Faculties. Engineering students were among the groups to be considered separately and as such were expected to working towards level three in Numeracy and IT, but level two in literacy.

When faced with the assessment, students were presented with a multimedia presentation describing how to go about completing the tasks (figure 1).

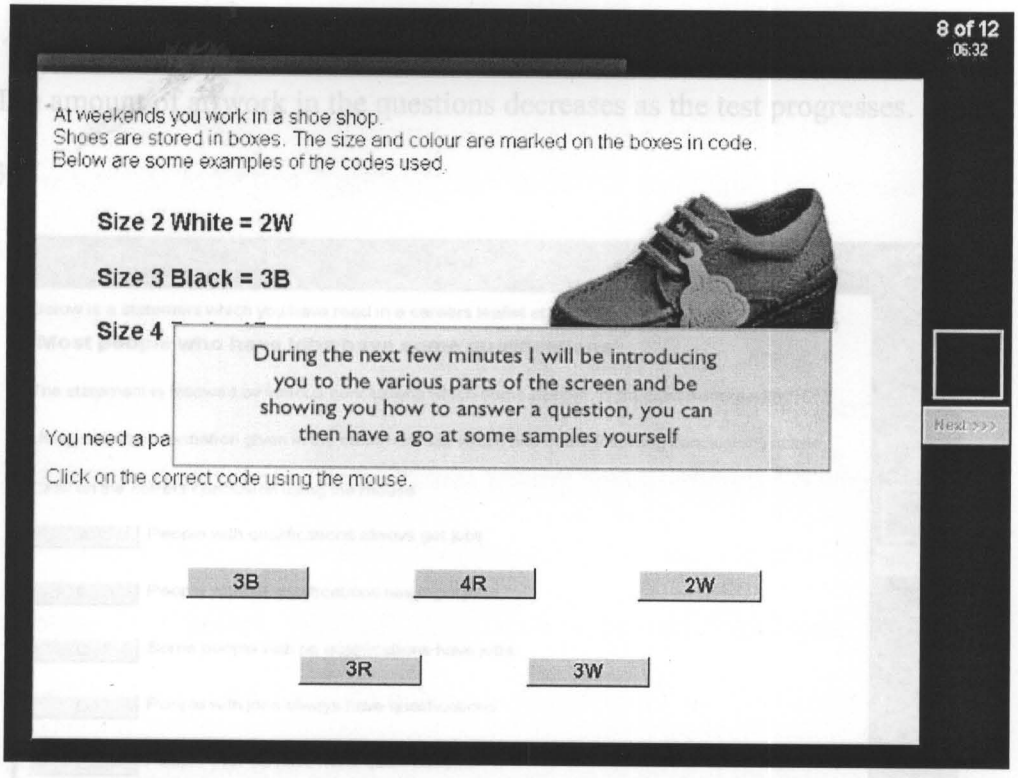


figure 1.

After a brief introduction into the manner of the testing procedure, the students are given sample questions to answer. (Figure2)

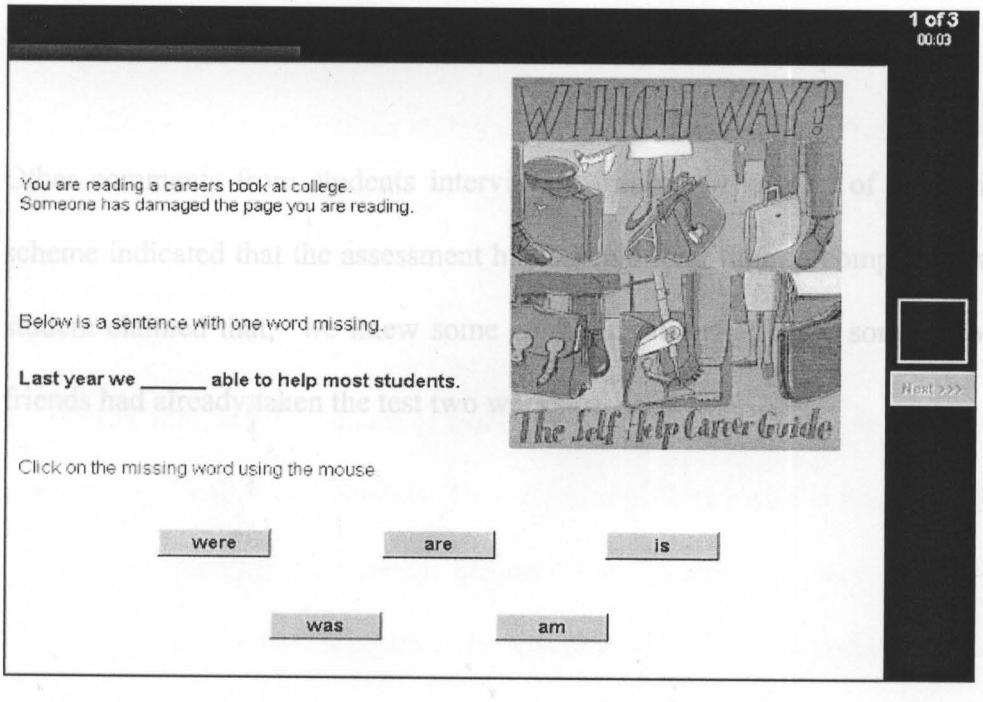
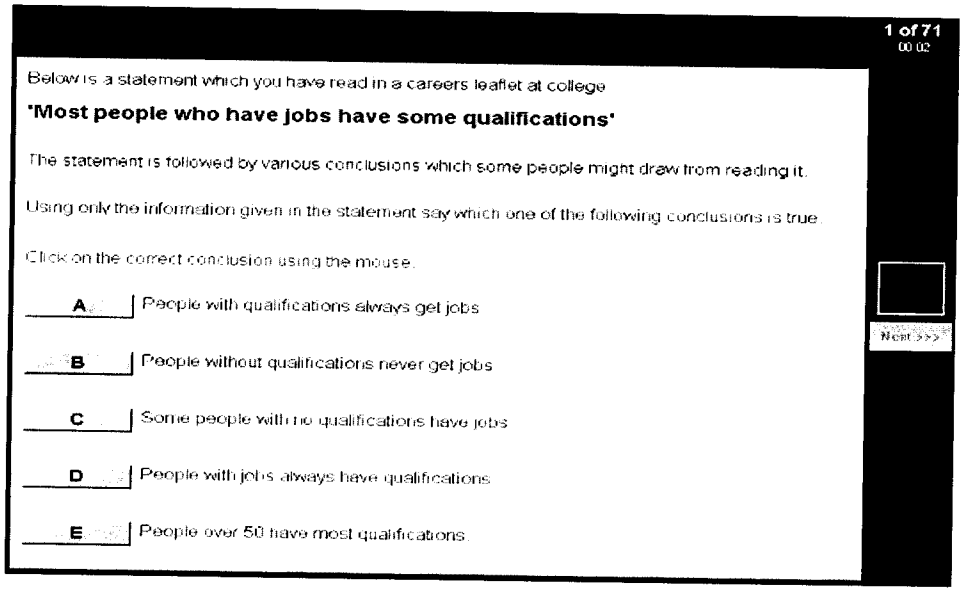


figure 2

The amount of artwork in the questions decreases as the test progresses. figure 3



Students reported that they found the test "easy" and "trivial" but later added that it "got harder as you went along." The single complaint being that the results were delayed. This issue is addressed below.

Other comments from students interviewed informally as part of a tutorial scheme indicated that the assessment had taken a long time to complete. One student claimed that, "we knew some of the questions already, some of our friends had already taken the test two weeks earlier."

4.4 Evaluation of Searchlight

There appears to be two significant and unrelated problems with the use of the Searchlight software.

1). The delayed results (some six to eight weeks). This problem occurred from the misjudgement of the initial testing level, whereby, with hindsight, the initial testing levels were inappropriate for the student cohort. This problem is it seems, political more than a practical problem; the levels reported by the software were below those estimated by the administrators of the test. A decision was taken by the senior management team responsible for this area of the curriculum to withhold student results until a meeting to be held late November 2000, which will address the issue of amending student results to bring them in line with the administrators, predicted grades.

2). The poor data-handling ability of the software. It appears from practice that the database is incapable of supporting a large number of concurrent users.

In order to look at the problem of inaccessibility of the database, an interview was arranged with Chris Simons (Data Handling Clerk) who is charged with the task of running the system. He reported, "There are issues with the software but in the main it seems to be working OK. We have had to limit the number of concurrent users because of access problems to the database." It

would appear that the software (developed by SHL (www.shlgroup.com)) was not engineered with this particular task in mind. Again, Chris Simons comments, "The Company weren't expecting the software to be used in such large organisations – they mainly do psychometric testing for corporations where the number of users is likely to be quite small. Also, it looks like a Microsoft Access database with a Visual Basic "front- end" therefore we are having trouble adapting it for our purpose – we just cant get at the code! SHL have advised us to let no more than twenty students use it at once."

In conclusion, it would seem that this iteration of Searchlight has met with limited success and thrown up many potential problems, not least being the inability of the software to cope with a high number of concurrent users. The Searchlight software still has some development work ahead of it but is clearly possible to make an assessment of a large body of students, using networked-learning technologies (including multimedia material) and to provide a database of the results, thus implying that support and monitoring procedures are tangible using this system perhaps with a modified database system, one known to cope with large numbers of concurrent users. Currently, however, the problems stated above need to be officially recognised and addressed by both the institution and the software manufacturer before the next cohort of students is inducted in September 2001.

4.5 Case Study 2 – The European Driving Licence (ECDL)

Another example of the college using an Intranet is to deliver part of the curriculum is the "European Computer Driving Licence" (ECDL) which is promoted in the UK by the British Computer Society (BCS). This case study deals with the integration of intranet-based learning into the curriculum by examining the way the College is delivering the European Driving Licence programme. The mode of delivery of the ECDL training material is flexible and can range from a teacher-centred approach to completely autonomous learning using CD-ROM or Intranet. The multimedia material used within the college for the ECDL is produced by "Electric Paper" using Authorware® from Macromedia and is an example of fully interactive multimedia.

Students using the interactive 'courseware' are presented with a tutorial on using the 'mouse' (figure 4) and can proceed at their own pace through the exercises. Students completely unfamiliar with a mouse can simply type "M" to receive full instruction and practice exercises on using it. Those more familiar, click on the image of the 'CD' and continue with other material. Testing is incorporated into the structure of the software and immediate feedback is given. This can be compared favourably to the experience of full-time students using Searchlight already documented.

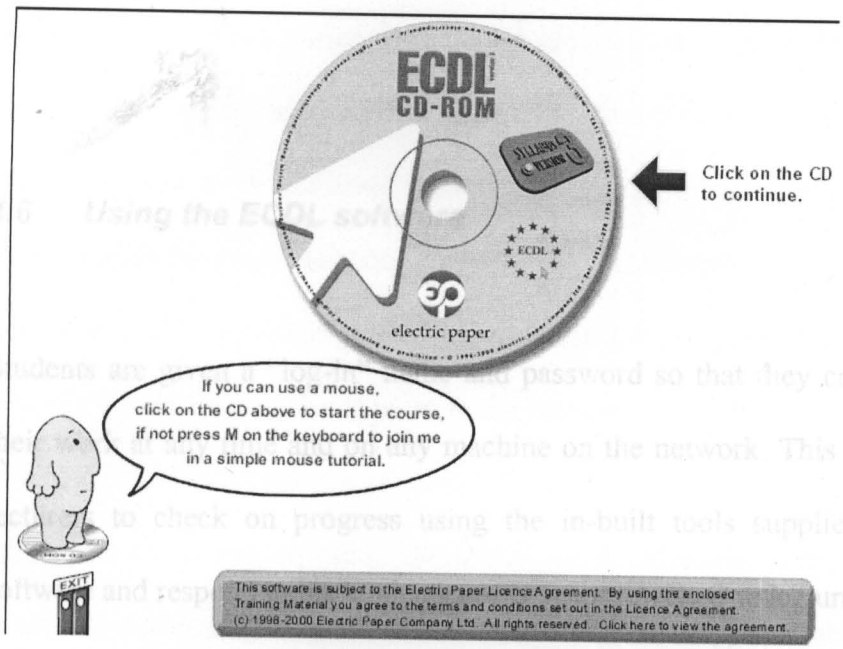


figure 4

The material is delivered in three distinct phases: "Assess, Train, Test". As the student progresses, he /she is assessed by completing exercises, can then be trained in the required area and finally tested. With a CD-Rom version, the students cannot save their work to a central location and details of their progress can only be assessed if they always use the same PC or somehow save the information on a removable disk. By using the software on an Intranet it is possible to keep records of students progress as a group as well as individually.

Record keeping has always been part of an educators role, but with expanding numbers and the requirement for reporting to external bodies, a system such as this is becoming important.

4.6 Using the ECDL software

Students are given a "log-in" name and password so that they can return to their work at any time and on any machine on the network. This also allows lecturers to check on progress using the in-built tools supplied with the software and respond to the students needs accordingly. One lecturer made the point that "If one or two students in the group are competent in a particular area, they can work on their own from the Intranet material. Conversely if there is someone who is lagging behind, then they can do some remedial work. Initial training apart, the process is quite quick to administer."

This approach is no different from what is perceived as typical good practice; tutors respond to students needs based on the individual student's assessment marks etc. However, it does automate the procedure somewhat and makes monitoring more streamlined.

The course is run within the college timetabling structure in two ways; either as part of a 15-week course for more advanced users, or as a 30-week course for beginners. There is some flexibility within this structure to allow for the differing progression rates of students; they may wish to defer their final tests or even take them earlier. To chart progress, on enrolment the student

purchases a logbook which is designed to record their progression through the individual elements of the course. At any time during the course, students can take a test to demonstrate their understanding of the concepts covered from each of the areas mentioned previously. Tutor input is set at two hours per weekly session, although students may use the computer facilities at any time during the day via their log-on to the Intranet.

Being able to access purpose made tutorial work and guidance in their studies is quite a different concept for most learners. Previously, timetable demands have put expert help beyond contact for much of the working day. Working from texts is advantageous in some areas of study, but where a practical approach is required (for example in practising word-processor skills) the multimedia teaching material is unique in its ability to be used in this way. Foe example, help on most aspects of Office or SmartSuite is available in an interactive tutorial type multimedia presentation. (figure5)

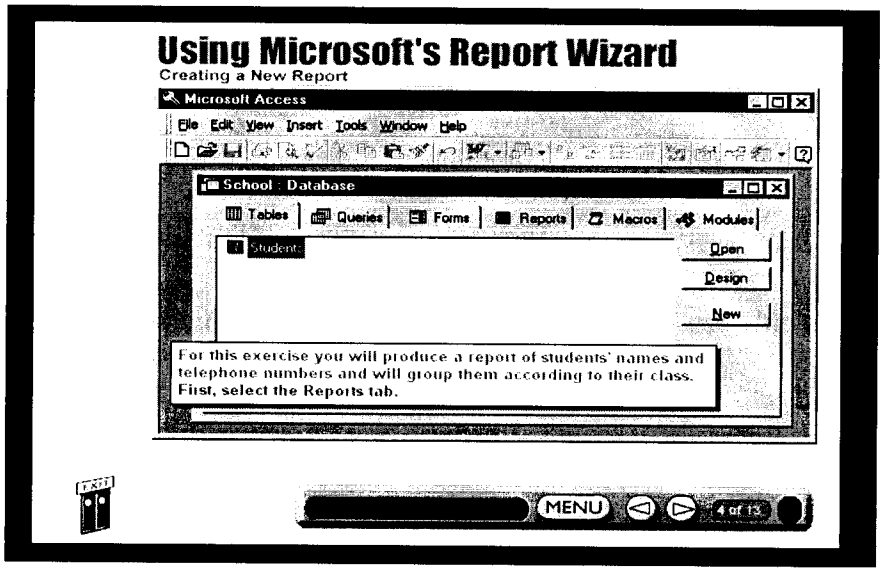


figure 5

Students on the ECDL courses were surveyed by questionnaire part of the way through the course. From the initial sample of 53 returned questionnaires, 34 were from ECDL students. A sample of 17 was drawn at random from these.

When asked if they felt the course could have been more satisfactory 65% said that more teacher input and less use of the multimedia learning material would be helpful, clearly indicating a propensity for teacher-led training. The inference is students need "help" even when the material is interactive. Almost all the respondents had access to PCs at home and work (q 5&6) and 71% had experience of installing software previously (Q9). The survey results indicate that students did not perceive there to be any problems worthy of comment with 82% reporting that information from the Intranet was "easy to find" and that the Intranet was "reliable" (qQ14&18). One student added the comment, "it was easy to check your learning quickly." And another said they felt "comfortable" using the software.

Although 65% wanted to spend more time engaged in teacher centred learning (q17d), a significant amount (41%) preferred to use the on-line tutorials provided (q17b). Comments surrounding this area of questioning included, "We know there is a teacher there during the lessons- so it's quicker to get an answer", and, "I liked using the web (Intranet) tutorials since I didn't have to bother the lecturer and they were easy to follow." Other typical comments

centred on the "alternative approach" theme, "We could try doing it in the lesson and then use the online test to see if we were getting it right". In fact, this was a common response to the request for "other comments" in Q19.

4.7 *Case study 3 – "WebWise"*

Alongside the ECDL, another area with which the college deals, is introducing learners to the Internet; a BBC program "WebWise" is used as the vehicle for introducing the topic to learners who have little or no experience of the Internet and covers areas such as e-mail, browsing and searching. This is a multimedia experience for the learners and is run either locally on the user's PC (from the Hard Drive) or directly from the CD-Rom. It can be accessed from the Intranet server but cannot be run directly; instead it has to be downloaded from the Intranet and then installed on the local hard drive. This method is not practical for the majority of people wishing to use WebWise since the students' downloading and installing skills are often lacking.

The original WebWise multimedia software portrayed an image of the Intranet and at no point actually connected to it. Instead it 'modelled' the environment in a series of examples through which the students worked.

These included sending email and searching in a web search engine. Figures 6 – 8 show screenshots of WebWise.

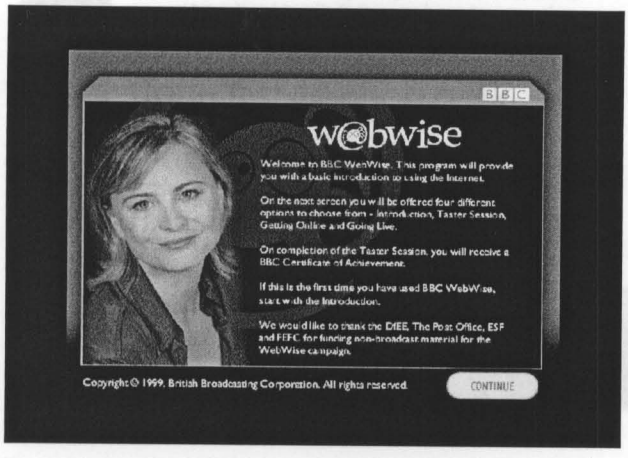


figure 6. Introductory screen

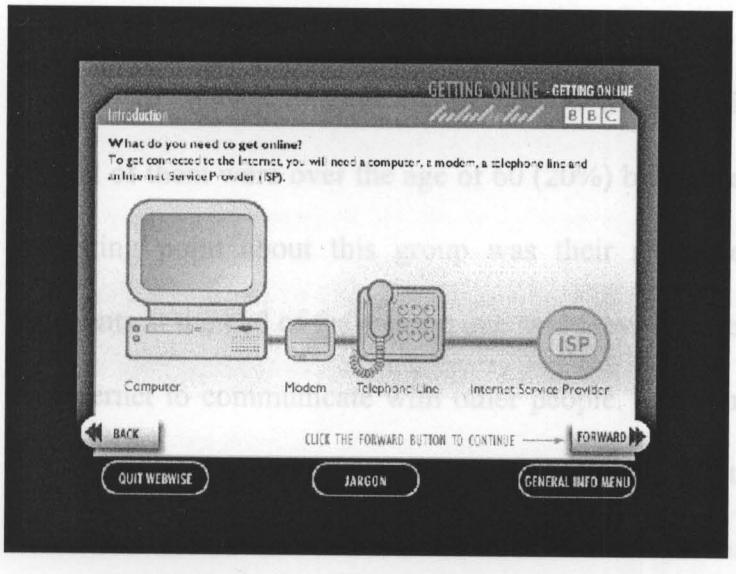


figure 7. Connecting to the Internet from a home PC

figure 8. using email.

Nineteen of the respondents to the survey were on the WebWise course. Several of them were over the age of 60 (20%) but all had a PC at home. The interesting point about this group was their response to the request for comments at the end of the survey; one said they, "wanted to get connected to the Internet to communicate with other people." And another, "I want to be able to exchange email with my daughter in Canada." Other reasons for being on the course stemmed from a desire "not to be left behind with technology" and "My kids use it all the time– I want to know what its all about"

80% had used software on a CD-Rom before (Q8) but only 20% thought they had used a CD to install software (Q9). There was a disparity here, since 60%

claimed they had used multimedia material based on CD-Rom (Q10); it being unlikely that the two answers to question 9 and 10 would be mutually exclusive. This would bear further scrutiny.

Almost half this group felt the balance between teacher-led and interactive software was about right (40%) although 60% did express a desire for increased teacher involvement (Q17 a, d).

These results seem to echo those from the ECDL case study; a significant proportion seeming to like the teacher-led approach (60% WebWise, 65% ECDL) although a higher number of ECDL students wanted to spend more time on interactive activities (41% compared to 20% of WebWise students).

In addition to the data obtained in this WebWise Case Study, the BBC has carried out some research of its own into the uptake of WebWise. The questionnaire is part of the BBC's quality auditing mechanism and looks at the national uptake of WebWise. (The results are reproduced by kind permission from the BBC and are reproduced in full in appendix C). The BBC survey results are only concerned with the demographics of participants and do not necessarily address issues concerning the use of multimedia as a learning tool. Relating this to earlier comments regarding the Searchlight software (4.2) it appears that the producers of such learning materials automatically assume that multimedia is a "good" learning tool without

perhaps carrying out the required level of consultation with the educational institutions responsible for delivering the material.

4.8 Perceived advantages / disadvantages of an Intranet

In addition to students being surveyed, interviews were held with colleagues responsible for delivering teaching/training using the Intranet and also with technical support staff involved in its day-to-day running. In general, it appears that once initial software problems were overcome the system runs well with little need for intervention, "The main problem was when the new Searchlight [base line assessment for key skills] software was installed they didn't upgrade the database that went with it – this caused us major headaches". (Peter Ward, Webmaster, Shrewsbury College). Indeed, it appears that when new software, that is to be delivered from the Intranet Server, is installed there are often problems, again Peter Ward comments, "Software developed in an industrial setting doesn't always translate to this magnitude of scale. If we have 500 users trying to access the same multimedia presentation then potentially everything could slow right down. Particularly if the users need to be submitting information to a database. Fortunately our network is coping well and even when complete classes have been using multimedia over the Intranet we have noticed no deterioration of service."

This research leads toward the conclusion that an Intranet is not a panacea for mass delivery of teaching materials, as there is often some fine-tuning of software to be done before a system/ program becomes fully functional. Dix et

al (1998) p188, exemplifies this, "...systems must be built and the interaction with users observed and evaluated in order to make them more usable."

This is borne out in this research in terms of the problems being experienced n the delivery of large-scale bench line testing (Searchlight 4.2) and the desire of students to maintain a close relationship with the facilitator and not use multimedia (however delivered) as a substitute.

CHAPTER 5

5.1 Future trends

The University for Industry

The University for Industry (Ufi) is a government initiative that seeks to promote the concept of 'lifelong' learning within the UK. (www.learndirect.co.uk), with the implementation of an advanced Intranet the college is set to take part in this programme. The development of web-based training is now well established and is leading away from the notion of software being released on CD-Rom; instead, it is to be made available via an Internet portal. The significance of this is that colleges with Intranets capable of delivering multimedia via an Intranet are well placed to take advantage of the growing market place for such training.

Having established an Intranet within the college, it remains to be seen whether the uptake in multimedia training materials will be as great as predicted and whether the infrastructure will cope with ever-increasing demands placed upon it.

It could thus be argued that the Intranet as a medium for the delivery of training materials is a rational and efficient use of the resource, but that future demands placed on it may have ramifications in terms of reliability and efficiency. With the uptake of Internet based (or Web-based) training

materials taking over in industry from the traditional CD-Rom vehicle, an Intranet with its associated higher bandwidth, is well placed to take advantage of the new emerging learning technologies. The basis for this argument stems from the desire for increasingly faster and more efficient use of the Internet (streaming multimedia is discussed elsewhere), which will drive software/ multimedia authors to develop more efficient systems that take best advantage of existing technologies.

The trends evident from the small survey reported, show a general acceptance of the Intranet as a medium for the delivery of teaching and learning materials in addition to the established use of CD-Rom multimedia software. Perhaps the Intranet will not replace CD-Roms; rather, it will be used to complement it.

The development of multimedia for Internet based applications, the use of products such as Lingo and Shockwave, ever increasing efficiency of networks and the ability to run increasingly sophisticated compression algorithms are combining to make a corporate or educational Intranet an essential medium for the delivery of quality training materials.

Organisations such as the Open University, the University for Industry and some commercial training organisations are pioneering the use of Internet based teaching. The corporate / educational Intranets are well placed to take

advantage of this work and will thus be able to deliver teaching materials, including multimedia of increasing quality, reliability and complexity.

The results agreed in principle with those found elsewhere from similar fields of research. In the paper "Observations on Web-Based Course Development and Delivery" Montgomerie and Harapnuik (1997) describe the results of a pilot study to produce web-based courseware. Their course was designed to follow "good androgogical (adult learning) principles; particularly that the user should be in control of their own learning (content, pacing, and sequencing), that alternative methods of learning the same material should be available, and that the subject area for assignments should, if possible, be the student's choice." They report on their students experiences and produced a forum for discussion. One of their students reported, "Some positive outcomes with distance ed. is the fact that a student can work on the material at any time that is convenient to them. The flip side of that is they do not have a opportunity to "rub shoulders" and network using both verbal and nonverbal communication." This seems to be reiterated by the high percentage of respondents in this research on the ECDL programme being able to "carry on with previous work easily" (Q15); with only 24% replying they did not find this easy to do.

The surveyed group consisted of a number of adult learners embarked on skills-based training as previously discussed. Montgomerie and Harapnuik's

paper concentrates on a generally lower age range of student and yet still reports similar findings.

It is also apparent from the small-scale study carried out here that the number of students with access to a PC at home was large (96%), noting that 20% of the WebWise students were above the state recommended retirement age (60+) it was interesting to see that 85% had access to a PC at work as well. The implication is that not all the members of this age group were necessarily retired and found it of benefit to embark on a course such as those described here. This finding further emphasises the focus of this research in that multimedia-learning material delivered via an intranet is increasingly accessible and desirable. 70% of respondents had prior experience of Internet use and 93% had used CD-Roms, however, a much smaller number (55%) had any experience of using a CD-Rom to install software – indicating that many had probably used CD-Rom based multimedia programs previously.

Until recently, companies have been exploring the use of the Internet and intranets cautiously. But as technology continues to improve their efficiency, the Internet and intranets will increasingly be used to deliver training of the type discussed here. This research leads to the conclusion that the training materials are being used by an expansive age range, and with the desire of its users for teacher *enhanced* study. The survey reported 63% requiring "more" teacher input into their coursework and this element of learning cannot be ignored.

When the Open University began piloting their on-line learning facilities, they eventually resulted in the course "T171, You Your Computer and the 'Net." Delivery was originally to have been via web site, CD-Rom and interactive conferences held on line within a structured environment. It transpired that the CD-Rom was not required and all students were expected to work from the web site. Thus, web-based teaching has become the sole method for the delivery of this particular course. In addition to the web-based media, two books were also specified as "readers" for the course. In the paper "Communication and Collaboration on line", Alexander (1998) outlines his view on the advantages of using a web-based medium for the course;

> "We can integrate in a single environment, study guides, learning material, discussions, assessment, administration and a range of student support tools such as diary, notebook, address book" (p59)

Thus, activity and collaborative techniques being used in courses such as those from the OU are likely to become the mainstay of the Intranet too.

The research carried out at Shrewsbury College has shown that learners are content to use an intranet as part of their learning programme -but not as a replacement for a facilitator. It shows that CD-Roms, although commonly used and available are considered interchangeable with material drawn from an Intranet, and finally, it seeks to promote areas for further research in the

area, for instance, the use of complete Managed Learning Environments as a medium for total autonomy over students progress monitoring, and the adoption by colleges of an Integrated Learning Technology strategy.

CHAPTER 6

6.1 Conclusions

Much research has been carried out in the past into the use of web-based learning, virtual learning, tele-learning etc. The focus of this research has been on the implementation of Intranet based learning and making a comparison with existing learning technologies. McConnell (1998) cites that, "A major factor in the up-take and use of ICT in education is the development of academic staff. This is particularly so in helping staff make the paradigm shift from "conventional" teaching and learning to teaching and learning in "virtual" or networked environments. He asserts that the distinctions that exist between on and off-campus learning are becoming increasingly blurred.

Cowham (1982) cited in "Challenges of Change- ICT and Lifelong Learning", emphasises the rapid development of such learning and teaching in education, "It is imperative for institutions to develop coherent attitudes and policies to the acquisition, application and organisation of computing, communications, and other ancillary equipment associated with information technology." This

is a clear statement that the development of teaching and learning materials adapted for technological media must not only be given a high priority, but reiterates McConnell's earlier statement that the issue of staff training must placed at the forefront of such advances in teaching strategies.

Coupled with this is the necessity for colleges (and other institutions) to develop their courseware in such a way that reflects the potential ICT offers in enabling individualised learning. Thus, the development of Information Systems which can track and support an individual students' progress as well as satisfying external accountability requirements are important steps in achieving the aim of providing effective learning environments. The use of multimedia learning materials has for several years been seen as an exciting additional resource to aid teaching and learning and has developed in complexity apace. The use of CD-Rom based tutorials, has become commonplace in many educational establishments, and with the ability to save student records (e.g. test scores) of work completed within a session, their use has been seen as almost essential in some areas of learning and teaching; particularly special needs where students ability to work for a period of time is inconsistent.

With the advent of affordable and reliable networks in educational institutions, the ability to deliver or serve material from a central location has not gone unnoticed by schools, colleges and universities alike and the development of complex Management Information Systems has now become

the norm. With additional requirements coming from central government to instigate and implement strategies for the concept of lifelong learning, there is increasingly the need for Intranet delivered services that allow for centralised recording of information about students progress in their studies.

The delivery of any course material using ICT requires an evaluation of the theory and practice of learning in order to make a shift towards networked or distributed / distance learning. The use of an Intranet as the medium for the delivery of it is well established. With the move from CD-Rom based multimedia training material to web-based or Internet multimedia the use of an Intranet is further justified. Cowham (1998) in the Keynote speech given to the International Conference on Networked lifelong Learning, goes onto state, "A learning environment must provide for access to structured content as well as systems for student support, including progress and achievement, normally in a learning centre." The idea of a learning 'centre' has to encompass the notion of a 'learning community', which has access to the required learning materials via any appropriate mechanism.

6.2 Managed Learning Environments

The design of 'managed learning environments' (MLE's) in educational institutions has adopted the Intranet as a basis for its propagation. They take the concept of an Intranet and develop it into a learning environment, which

gives support for student-centred resource based open learning model. This implies that the resources are available in different ways; either structured (ECDL for example), or as a research led approach in which the learner can use the environment to study by locating resources him/herself. Typically an Intranet gives access to both these methods of learning but the inception of a complete managed learning environment goes a step further and gives support for the whole learning process. This may include recording data about the individuals learning to promote or 'push' information towards them, information that is tailored to the individuals assumed requirements.

Timely support for the learner, including detailed tracking of their progress is crucial (Donovan 1996). The extra dimension that the MLE brings to Intranet based learning is that this can be accomplished, since a learning environment provides immediate one-to-one support by simply clicking an e-mail link in order to seek help, and student progression is automatically recorded – even allowing a tool for the flagging of late assignments to be devised or implemented.

Thus, the delivery of multimedia teaching and training materials via an Intranet is not only an appropriate use of a valuable resource but is also one which can be seen as the first steps towards implementing a complete managed learning environment. The rapid development of multimedia technology, its adaption for internet-based training and thus its natural progression to an Intranet based resource imply that it will continue to become

increasingly important as a resource in all educational / training institutions. With the advent of better *live-streaming* technologies (to enable better video-conferencing with fully moving live images), the inclusion of 'video–on-demand', and the more efficient uses of bandwidth, that are set to be available in the next few years, the use of Intranets will continue to grow in our educational and industrial environments to promote training.

REFERENCES

Alvear, J, 1998, *WebDeveloper.com*, Wiley

Anastasi, A, 1988, *Psychological testing, I* Macmillan,New York,

Andersen, *et al*,1999, *Inside Windows Media,* QUE

Bassey M, 1999, *Case Study research in Educational settings,* Open University Press

Bell J, 1999, *Doing your research project* Open University Press Benbassat I Goldstein D Mead M, 1987 *The case research strategy in studies of information systems* MIS Quarterly 4

Berners-Lee, 1999, *Weaving the Web* Orion Business Books

Biggs J, 1999, *Teaching for Quality Learning at university,* Open University Press

Casselberry R, 1996, *Running a Perfect Intranet* QUE

Dix, Finlay, Abowd, Beale, 1998, *Human Computer Interaction 2nd Edition* Prentice Hall, New Jesey

Donovan K, 1996, *Student tracking* Developing FE, 1 (1)

Duff J,1996, *Laura Lemay's Web Workshop Graphics and WebPage Design,* SAMS

England E & Finney A, 1999, *Managing Multimedia – Project management for interactive media* Addison Wesley – Pearson Education

Faulkener *et al*, 1993, *Methodology handbook* Open University Press

Gelber S, 1991, *Introduction to DataCommuniations – a practical approach,* Professional Press books

Gillham B, 2000, *Developing a questionnaire,* Continuum, London Gould M & Thuston V, 1995, *Windows 95 multimedia Programming* MIS Press Inc USA

Howe D, 1999, *The Free Online Dictionary of Computing* www.instantweb.com/~foldoc/

Korolenko M, 1997, *Writing for multimedia* Wadsworth Publishing USA

Kumar R, 1999, *Research Methodology* Sage Publications London

Lynch J Horton S, 1999, *Web Style Guide* Yale University Press

Lynch J Horton S, 1997, *Web C/AIM Style Guide* Yale University Press

Lynch. P, 1994, *The Evolving Interface of Multimedia, Yale Centre for Advanced Instructional Media Published, Syllabus Magazine, 8(3):48-50* Yale University Press

Neusholtz N, 2000, *Introduction to Director and Lingo. Multimedia & Internet Applications,* Prentice Hall, New Jersey

Peräkylä A, 1997, *Reliability and Validity in research based on tapes and transcripts. In Silverman D (Ed) Qualitative research, theory method and practice.* Sage Publications London

Robert G *et al*, 1999 *"The multimedia marketing experience" (cited in Active Learning 1999 pp9-15)* CTISS Publications

Rudestam K & Newton R, 1992, *Surviving your Dissertation* Sage Publications London

Silverman D, 2000, *Doing Qualitative research- a practical handbook* Sage Publications London

Stanek W, 1996, *Web Publishing Unleashed* . SAMS

Web site URL's

www.becta.org.uk	British Educational Communications & technology Agency
www.clicktolearn.co.uk	Multimedia website under construction
www.focus.com	Managed Learning Environment Development
www.instantweb.com/~foldoc/	Free On line Dictionary of Computing
www.bbc.com/webwise/index.htm	BBC WebWise information
www.macromedia.com	Producer of Director and Lingo multimedia authoring packages
www.learndirect.com	University for Industry development

APPENDIX A

Questionnaire.

Please complete this questionnaire and return it to your tutor at you earliest convenience. If possible, fill it in before leaving the session. The questionnaire is informing research on the use of an Intranet to deliver multimedia-learning material.

Thank you,

Cameron

Please circle your choice, or comment as appropriate.

1. Gender male female

2. Age group

under 19	20-29	30 –39	40-49	50-59	60 or over

3. Course_____

4. How do you rate your expertise with a PC?

Novice	Intermediate	Advanced

5 Do you use a PC at home? Yes / No

6 Do you use a PC at work? Yes / No

7	Have you used the Internet before coming on this course?	Yes / No
8	Have you used a CD-Rom on a PC before?	Yes / No
9	Have you installed software before coming on this course?	Yes / No
10	Have you used a multimedia CD-Rom before?	Yes / No
11	Did you use a CD-Rom as part of your course?	Yes / No
12	Did you use the Intranet as part of your course?	Yes / No
13	Was the information you needed from the CD-Rom easy to find?	Yes / No
14	Was the information you needed from the Intranet easy to find?	Yes / No
15	Were you able to continue with previous work easily?	Yes / No
16	Please comment on your answer to Q15.	

17 Did you feel you could have completed the course in a more satisfactory way? Please tick any of the following statements that apply.

More teacher input, less use of the multimedia learning material.

More use of multimedia learning material, less teacher input

More time spent in interactive activities (e.g. following a tutorial on the PC).

Less time on interactive activities (e.g. following a tutorial on the PC).

The balance was about right between taught work and the use of the interactive multimedia material

18 Did you feel the Intranet was reliable (e.g. it didn't stop working unexpectedly)

Yes/No

19 Please add any additional comments regarding the methods of delivering this course to you below.

Thank you for the time you have spent completing this questionnaire.

APPENDIX B

Results from Questionnaire.

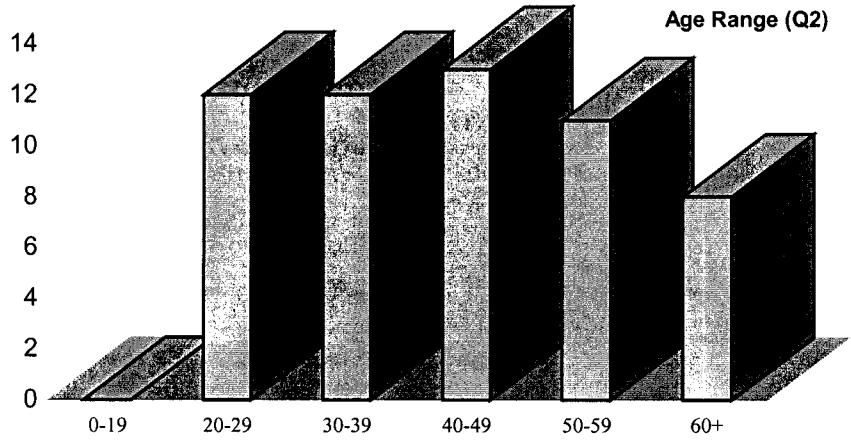
Responses to the questions are summarised;

Surveys distributed = 60

Surveys Returned = 53

Q1 62.5% male 37.5% female (from all returned surveys)

Q2. Ages – from all questionnaires



Q3. Course 19 WW 18 ECDL (int) 16 ECDL (adv)

	WebWise	ECDL
Q4 Expertise	80% novice	71% Novice
	20% Intermediate	18% Intermediate
	0% expert	12% advanced
Q5. PC at home	100% yes	94% Yes
Q6. PC at work	70% Yes	100% Yes
Q7. Prior use of internet	30% Yes	94% Yes
Q8. Prior use of CD-rom	80% Yes	100% Yes
Q9. Install software	20% Yes	76% Yes
Q10. Prior use of multimedia CD-Rom	60% Yes	100% Yes
Q11. CD-Rom as part of course?	100% Yes	12% Yes
Q12. Intranet as part of course?	100% Yes	100% Yes
Q13. Information easy to locate on CD-Rom?	40% Yes	94% Yes
Q14. Information easy to locate on Intranet?	60% Yes	82% Yes
Q15. Continue with prior work easily?	N/A	77% Yes

Q16 Comments		
Q17	A 60% agree	65% agree
	B 0% agree	41% agree
	C 20 % agree	41% agree
	D 60% agree	65% agree
	E 40% agree	24% agree
Q18 Intranet reliable	100% agree	83% agree
Q19 Comments		

APPENDIX C

BBC survey results for "WebWise"

As part of the induction procedures for new students, a program developed by the British Broadcasting Corporation BBC aimed at developing Internet skills (called "WebWise") was used to introduce students to the use of the Internet (some had extensive Internet experience and others were beginners). The BBC has carried out some research of its own into the uptake of this program. WebWise has been used across all age ranges with a degree of success, and a questionnaire is part of the BBC's quality auditing mechanism. The results are reproduced by kind permission from the BBC.

Demographic information

Reproduced below is information already in the public domain published by the BBC on their website.

Phase One Report May/June '99 from the BBC

Response Data from Users

58% women attended sessions. Highest age range was 25 - 45

65% of people attending taster sessions were parents

89% of people attending taster sessions were either absolute beginners or beginners

99% of people said they had learnt something from using the WebWise CD-Rom

86% of people said as a result of attending a WebWise taster session they now feel confident using the Internet

33% of people were unemployed (11% were unemployed for over 2 years)

17% of people attending taster sessions were disabled

80% of partners still offering sessions, WebWise stimulated renewed interest in "Computers Don't Bite"

79% of people who phoned have attended a taster session already (40%) or plan to attend shortly

81% of people agreed with the statement that it was a good idea for the BBC to produce an IT skills campaign like WebWise (70% strongly and 11% slightly)

68% named the BBC (unprompted) as the broadcaster responsible for the whole WebWise campaign